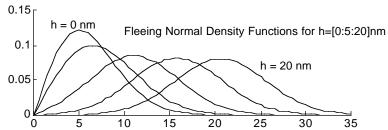
Search and Detection Fleeing Normal Target

At time 0 a circular normal target with $\sigma\text{=}5\text{nm}$ begins fleeing on a random course $\theta\text{-}\text{U[0°,360°]}$ at speed u=10kt.

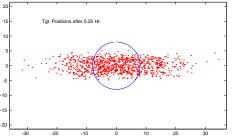
1. Using MATLAB, calculate and plot the density function for range to datum at times t=[0:.5:2] hours. Your graphs should look like this:

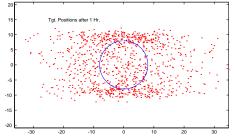


Notes: i) h=t*u, ii) in MATLAB, $I_a(x) = besseli(a,x)$.

2. At time t=1hr, a detection device with range $8 \, \mathrm{nm}$ is placed at datum. Use MATLAB to calculate Pd by numerically integrating the appropriate density function from 0 to $8 \, \mathrm{nm}$. (.2426)

3. Now calculate Pd for the same scenario except that at time 0 the target's distribution is BVN with $\sigma x{=}10 nm$ and $\sigma y{=}1 nm$. Use MATLAB to generate 5000 initial target positions from this distribution. Then select 5000 uniformly distributed, fleeing courses. For each course, calculate the x- and y- displacements occuring in 1 hour, and add to the initial positions. Pd is then the fraction of final positions within 8nm of datum. $(Pd{\approx}.19)$





4.a. To verify the answer obtained in 2., repeat the simulation in 3. with $\sigma x{=}\sigma y{=}5nm$. Use N=5000 replications. Find the 95% confidence interval for Pd.

4.b. For each of the 5000 target positions after 1 hour in 4.a, calculate the range to the origin. With MATLAB, plot this data as a histogram and compare to the theoretical density obtained in 1.

